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Chemical Abundances and the Hierarchical Clustering

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Abstract. We studied the chemical enrichment of the interstellar medium and stellar population of the building blocks of current typical galaxies in the field, in cosmological hydrodynamics simulations. The simulations include detail modeling of chemical enrichment by SNIa and SNII. In our simulations the metal missing problem is caused by chemical elements being locked upon in the central regions (or bulges) mainly, in stars. Supernova energy feedback could help to reduce this concentration by expelling metals to the intergalactic medium.

We studied the chemical enrichment history of the structure in a hierarchical scenario by using a cosmological SPH code which includes detail chemical enrichment by SNIa and SNII (Mosconi et al. 2001). In order to compare with available observational data we draw random line-of-sight (LOS) through the building blocks of current typical galaxies in the field. We estimated the HI densities columns and chemical abundances of different elements as a function of redshift. We studied the column densities that satisfied the observational criteria used for Damped Lyman Systems. Our results show that when mapped by random LOS the gaseous components in building blocks show the same level of metallicity enrichment (≈ -0.30) and α-enhancement as those estimated for the observed DLAs (Tissera et al. 2002; Cora et al. 2003) . The star formation rate per unit are in the simulated DLAs are, on averaged, an order of magnitude lower than those of the whole system (Tissera & Lambas 2004). Comparing the mean abundances of the gaseous components and the stellar populations along the LOS and those of the whole galactic systems, we found that the simulated DLAs unpredicted the abundances by $\approx 40 - 70\%$. The missing metals are located in the central regions of the simulated galactic systems and mostly locked up in stars. These regions are mapped with a lower probability by LOS because of geometrical effects. Our results suggest that the metal missing problem (Pettini 2003) could be produced by chemical elements being locked stars and in the central regions. However, we note that SN galactic wind could be able expelled a significant fraction to the intergalactic medium reducing the problem.

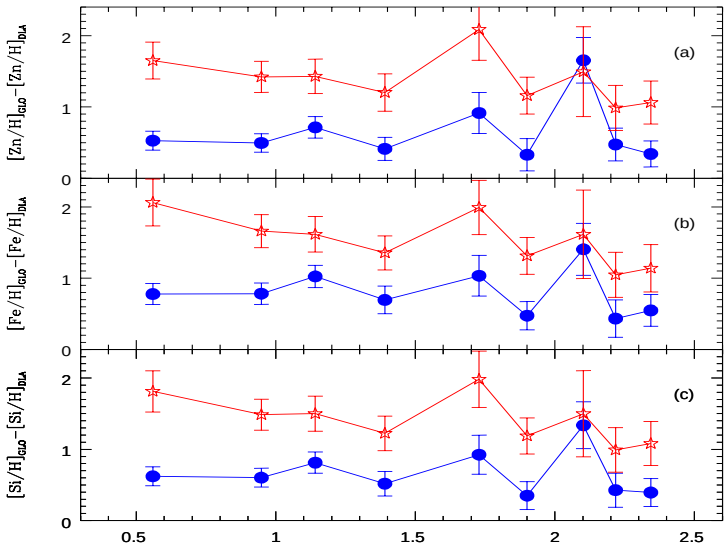

Figure 1. Averages of the differences between the mean abundances of the gaseous components (filled circles) and the stellar populations (open stars) in the simulated DLAs and those of their hostes systems as a function of redshift. Bootstrap errors shown.

References

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